

# Comparison of Misgav-Ladach and Pfannenstiel-Kerr Techniques for Cesarean Section: A Randomized Controlled Trial Study

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Received 2016 April 17; Revised 2016 September 13; Accepted 2016 September 14.

## Abstract

**Background:** Cesarean section is one of the most common surgeries around the world. There are several different techniques for cesarean section. The most common techniques are Pfannenstiel-Kerr (PK) and the newer technique Misgav-Ladach (ML). The objective of this trial was to compare intraoperative and short-term postoperative outcomes between the Pfannenstiel-Kerr and the modified Misgav-Ladach techniques in primary cesarean deliveries.

**Methods:** In a prospective controlled trial, 100 females were randomly assigned to the PK (n = 50) and ML (n = 50) groups. The two groups were compared in terms of duration of surgery and fetus delivery, blood transfusion, febrile morbidity, analgesic use, changes of hematocrit level, bowel transition time, wound infection /dehiscence and neonate five-minute Apgar score.

**Results:** The duration of surgery and fetus delivery was significantly lower in ML than PK technique (P = 0.000). Analgesic use during the post-operative period was significantly lower in ML than PK (P < 0.001). There were no significant statistical differences between the groups in regards to drop of the hematocrit (P = 0.32), fever (P = 0.056) and bowel transit time (P = 1.000). The mean Apgar score of fifth minute was  $8.80 \pm 0.57$  and  $9.89 \pm 0.42$  in PK and ML groups, respectively (P < 0.001).

**Conclusions:** Misgav-Ladach appears to be faster, requires shorter incision and less analgesic drugs than PK, which might lead to better postoperative outcomes.

**Keywords:** Cesarean, Misgav-Ladach, Pfannenstiel-Kerr

## 1. Background

The Misgav-Ladach (ML) technique, for cesarean delivery, was described by Michael Stark based on the Joel-Cohen incision (1). The technique was initially introduced at Misgav Ladach hospital, Israel and so is known by the hospital where it was development. This new technique for abdominal wall opening was described by Joel-Cohen et al. in 1972 (2). The procedure includes transverse skin incision 5 cm above the symphysis pubis and blunt dissection of all abdominal walls. One layer suturing of the uterus (3-7) and non-closure of the peritoneum were also considered by many during 1980s and 1990s (8-13). All three modifications were performed by Stark et al. in 1995 (14-16).

The ML technique in comparison to Pfannenstiel-Kerr (PK) has several advantages, the most important being manual manipulation instead of using sharp instrument, faster recovery, shorter operative time, less blood loss, using less suture material and more satisfaction about the scar of surgery and shorter anesthetic time (1).

Cesarean section is a well-defined surgery among ob-

stetric surgeries and considerable advances in this procedure are essential. The advantages of ML cesarean section are least possible trauma to the tissues, and surgery in the simplest way. The lower incidence of fever and urinary tract infection, lower use of antibiotics and narcotics, faster return of normal bowel function, shorter maternal hospital stay and less postoperative adhesion formation are the other benefits of this techniques. This method of cesarean section is suitable for elective and emergency procedures (17).

Because, the technique of choice for cesarean section at our hospital and most other hospitals in Iran is PK, it was decided to perform this study and the objective of this study was to compare some intraoperative and short-term postoperative outcomes between the Misgav Ladach and the classic cesarean section technique described by Pfannenstiel and Kerr.

## 2. Methods

This study was a prospective randomized controlled trial that recruited 100 female participants referred to Amir al Moamenin hospital, Semnan, Iran from April 2013 to September 2014. The inclusion criteria were: first cesarean surgery, elective cesarean surgery, primary infertility (male factor) more than eight years, normal body mass index (18-25) and using spinal anesthesia. Also, females with prior surgery of the uterus, coagulation disorder, use of general anesthesia and any underlying disorder were excluded. After selection of subjects, they were randomly allocated to ML (n = 50) and PK (n = 50) groups. The randomization method of the study was balanced block randomization. Written informed consent was obtained from all cases. The study was approved by the local ethical committee.

In the ML group, a Pfannenstiel transverse skin incision 5 cm above the symphysis was performed and the subcutaneous tissue was opened until it reached the rectus sheath. Lateral extension of the subcutaneous tissue, incision of rectus sheath and separation of the two rectus muscles were digitally performed. The parietal peritoneum was digitally opened at the upper part of the space between muscles. A transverse 2-cm incision in lower uterine segment in the midline involving both peritoneum and myometrium was accomplished. After lateral digital extension of the uterine incision, the fetus was extracted and the placenta was removed. The uterine fundus was removed from the abdominal cavity for suturing. Closure of the uterine incision was performed with a one-layer continuous #1 polyglycolate coated violet (VicrylI, Supa Co, Iran) suture. After the inspection of the peritoneal cavity and removal of accessible blood and clots, the visceral and parietal peritoneum was left without suture. The rectus muscles, subfascial space, and subcutaneous tissue were inspected for homeostasis, and the rectus sheath was closed using a continuous #1 polydioxanone absorbable violet-monofilament (TebKeyhan Co. Iran) suture. The subcutaneous tissue was sutured if its depth exceeded 2 cm. The skin was closed with continuous subcuticular suture.

In the PK technique, the skin was opened with a Pfannenstiel incision, extended through the subcutaneous tissue with a scalpel until the rectus sheath was exposed. The rectus sheath was then opened in the midline. Scissors were used to extend the rectus sheath incision laterally and to separate it from the pyramidalis and rectus muscles. The parietal peritoneum was opened with scissors after being elevated between two Kelly's clamps. A transverse low uterine segment peritoneal incision was performed with a scalpel in the midline and then extended laterally with scissors. The peritoneum was dissected downwards with

scissors to create a bladder flap. The myometrium was incised in the midline with a scalpel, and the remaining uterine fibers and fetal membranes were opened with a Kelly's clamp. After lateral extension of the uterine incision, the fetus was extracted and the placenta was removed. Closure of the uterine incision was performed with a two-layer continuous #1 polyglycolate coated violet (VicrylI, Supa Co, Iran) suture, using additional homeostatic stitches if required. The visceral peritoneum was closed with a continuous #2/0 polyglycolate coated violet (VicrylI, Supa Co, Iran) suture. After the inspection of the peritoneal cavity and aspiration of all blood and clots, the parietal peritoneum was closed in a similar fashion. The rectus muscles, subfascial space, and subcutaneous tissue were checked for homeostasis, and the rectus sheath was closed with a continuous #1 polydioxanone absorbable violet-Monofilament (TebKeyhan Co. Iran) suture. The subcutaneous tissue was sutured if its depth exceeded 2 cm. The skin was closed with separate continuous subcuticular #2/0 polyglycolate coated violet (VicrylI, Supa Co, Iran) suture.

Main outcome measures were defined as the duration of surgery, duration of fetus delivery, blood transfusion during or after surgery, febrile morbidity, postoperative analgesic use, changes of hematocrit level, bowel transition time, wound infection /dehiscence and Apgar score of neonates.

A questionnaire was used for gathering data on duration of surgery (the time from the beginning to the end of the operation), duration of fetus delivery (the time from the first incision to delivery of fetus), blood transfusion during or after surgery, febrile morbidity from surgery to one week post operation, postoperative analgesic use during 48 hours from the end of operation, changes of hematocrit level from surgery until discharge from hospital, bowel transition time (more than 24 hours), wound infection and dehiscence (from surgery to one week post operation) and Apgar score of neonates in five minutes for all subjects.

Statistical analyses were performed using Mann-Whitney, Pearson's chi-squared and Fisher's exact tests and excel Computer software. A P-value of less than 0.05 was considered statistically significant.

## 3. Results

The mean age  $\pm$  Standard Deviation (SD) of the ML group was  $27.40 \pm 5.36$  versus  $27.04 \pm 5.02$  in the PK group, and the difference was not significant ( $P = 0.730$ ) (Table 1). The mean body mass index  $\pm$  SD of the ML group was  $24.14 \pm 2.05$  and in PK group was  $23.56 \pm 2.33$ . The two groups had the same body mass index ( $P = 0.358$ ).

**Table 1.** The Characteristic of the Study and Control Groups<sup>a</sup>

Characteristics	Misgav-Ladach	Pfannenstiel-Kerr	P value
BMI	24.14 ± 2.05	23.56 ± 2.33	0.358
Age, y	27.40 ± 5.36	37.04 ± 5.02	0.730
Haematocrit (Percentage)	35.80 ± 3.43	36.43 ± 3.05	0.336
Hematocrit (Percentage)	32.77 ± 4.16	33.28 ± 3.32	0.502

Abbreviation: BMI, body mass index

<sup>a</sup>Values are expressed as mean ± standard deviation.

The duration of surgery (minutes) was significantly lower in ML than PK technique ( $14.64 \pm 1.98$  versus  $36.06 \pm 6.41$ ) ( $P = 0.000$ ) (Table 2). Duration of fetus delivery in 46 cases (85.2%) of ML group and in eight cases (14.8%) of PK group was less than two minutes from the beginning of surgery, with the duration being significantly lower in ML than PK technique ( $P = 0.000$ ) (Table 2).

Also, use of analgesic during 48 hours after operation for pain relief in the ML group was significantly less than the PK group ( $P = 0.001$ ) (Table 2).

None of the cases of the two groups received blood transfusion during or after surgery. Post-operative fever was not observed in any of the cases of ML technique; however, it occurred in five cases of PK technique. Nevertheless, there was no significant difference between the groups ( $P = 0.056$ ) (Table 2). Also, the drop in hematocrit level was not significantly different during the postoperative period among groups ( $P = 0.32$ ) (Table 2). Bowel transit time was longer than 24 hours in one case of each group, thus the two groups were matched in regards to this variable ( $P = 1.000$ ) (Table 2). Neither wound infection nor dehiscence occurred in any cases of the groups. The mean Apgar score of five minutes in ML was more than the PK technique ( $P < 0.001$ ) (Table 2).

#### 4. Discussion

The ML method is restrictive in the use of sharp instruments, while manual manipulation is preferred. Quicker recovery, less use of post-operative antibiotics, anti-febrile medicines and analgesics, and shorter working time for the operative team are the advantages of this technique (1). In this study, the standard technique of ML with using manual manipulation was used and there was shorter working time for the operative team and less use of analgesic in ML than the PK technique.

Some advantages of the ML method of caesarean section over the PK technique are significantly faster performance, and reduced used of suture material (18). In this

study, similar to the study of Studzinski et al. (18), the duration of surgery was significantly lower in ML than PK technique and the use of suture material in ML was less than PK.

The ML method is a simple, cost-effective and rapid caesarean technique that appears to be a suitable alternative to PK caesarean section (19). In this study, in addition to more rapid surgery in ML versus PK, the suture material use and so the cost of surgery was less in ML than PK technique because only three layers of stitches were used in ML compared to seven to eight layers in PK.

The ML method of caesarean section enables fast recovery and shorter hospitalization, and reduces the length of the operation, the incidence of surgical complication and the consumption of surgical materials (20). In this study, length of surgery was significantly lower and the using of surgical material was also less in ML.

Less short and long-term complications are some of the advantages of Misgav-Ladach modified technique since the duration of surgery is shorter in ML technique. Therefore, it is preferred in all emergency caesarean sections (21).

There is lower incidence of peritoneal adhesion formation in ML technique than PK technique as a post-operative complication of prior caesarean section (22). A longer follow-up study should be considered in order to show the status of abdominal adhesion formation after the ML technique. However, short follow-up showed significant reduction in operative time and less bleeding (23). In our study, as a research on first time caesarean section of elective cases on the adhesion formation after caesarean was not possible but the operative time was shorter in ML than PK.

The ML method is safe in twin pregnancy and advantages like postoperative pain reduction, faster recovery, and no need for transfusion have been indicated (24). In this study, there was no significant difference between the two groups in relation to need for blood transfusion. The possible cause may be because first time elective caesarean in singleton fetuses were studied and in elective and first time surgery it is expected to find these results.

In females who tried a vaginal birth after a prior ce-

**Table 2.** The Comparison of Variables of the Study between Experimental Groups<sup>a</sup>

Variable	Misgav-Ladach	Pfannenstiel-Kerr	P Value
Duration of surgery, min	14.64 ± 1.98	36.06 ± 6.41	< 0.001
Duration of delivery, min	46 (92)	8 (16)	< 0.001
Analgesic use, h	3 (6)	25 (50)	< 0.001
Mean drop of HCT (percentage)	3.02 ± 2.15	3.14 ± 2.83	0.812
Post operation fever (Day)	0 (0)	5 (10)	0.056
Bowel transit (24 hours)	1 (2)	1 (2)	1
Apgar Score, min	9.89 ± 0.42	8.80 ± 0.57	< 0.001

<sup>a</sup>Values are expressed as number (percentage) or mean ± standard deviation.

sarean section it has not been found that ML cesarean section method might be more likely to result in uterine rupture. Therefore, it is recommended for this cesarean section technique to be considered in daily clinical practice (25). In our study it was not possible to do vaginal birth after cesarean section because it was the first time that all cases were undergoing cesarean section.

Shorter duration of surgery, fetal extraction time and less analgesic needs are other advantages of the ML technique versus PK. In the present study, also incision to delivery time and less analgesic needs were the advantages of ML versus PK (26).

One of the findings of this study was the less incision to delivery time and a higher Apgar score in five minute with the ML technique. Therefore, it can be concluded that incision to delivery time is important for the future of the fetus and longer time may be associated with more neonatal complications. The new findings of this study was shorter delivery time of fetus with better Apgar score in five minutes that may have an effect on the neurodevelopment of the child in the future. However, it is recommended to perform more studies in regards to the effect of this technique on the future of the fetus.

In the study of Hudic et al. no significant differences were observed between the two techniques regarding the incidence of endometritis, wound dehiscence, post-operative antibiotic use and duration of hospital stay (27). In this study, no case of wound infection or dehiscence had occurred. Ghahiry et al. showed that single layer suturing of uterus and leaving the peritoneum intact in ML technique is associated with lesser dense adhesion and chronic pelvic pain in the future, in comparison to the PK technique (28). Also, the study of Bolze et al. showed that the ML technique of cesarean section is possible to perform in three-fourths of patients with prior cesarean section yet it is usually associated with a slight increase in incision to delivery time (29).

This study had several limitations including: 1, some patients did not refer after one week and this forced us to increase the number of cases to reach the sample size; 2, Because all of our cases were having their first cesarean, it was impossible to evaluate the adhesion formation that is an important complication of every surgery.

In conclusion, in patients who underwent first elective cesarean section, ML technique may result in faster operation and duration of incision to delivery of fetus, a higher Apgar score in five minutes and also less time is needed to use analgesics than the PK technique.

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